SOLAR/1013-79/03

Monthly Performance Report

J. D. EVANS

HOUSE B

MARCH 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

J. D. EVANS, INC.
HOUSE B

MARCH 1979

I. SYSTEM DESCRIPTION

J. D. Evans, Inc., House B is one of two instrumented single-family residences in Columbia, Maryland. The home has approximately 2250 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 374 square feet. The array faces south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in the basement in a 1000-gallon steel storage tank. Incoming city water is preheated in a liquid-to-liquid heat exchanger located in the storage tank and then flows into a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat exchanger within a heat pump and an electrical heating element in the air-distribution duct provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the temperature difference between the storage tank and the collector outlet is higher than 15°F. Water circulates from the storage tank through the collector until a temperature difference of less than 5°F is reached.

Mode 2 - Storage-to-Space Heating: This mode activates when thermal energy for space heating is requested by the room thermostat. Solar-heated water from storage circulates through a liquid-to-air heat exchanger in the space heating air duct. If solar energy is insufficient to satisfy the space heating load, the heat pump and/or the auxiliary electrical heating element will be activated. The electrical strip heater can also be manually operated without solar heating and heat pump operation.

Mode 3 - DHW Preheating: This mode is activated by drawing hot water from the system. Cold supply water is preheated in a liquid-to-liquid heat exchanger located in the solar energy storage tank before flowing to the DHW tank. If the required DHW tank temperature of 140°F is not maintained by solar preheating, auxiliary energy is provided by the electrical heating element in the DHW tank.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in March and the solar energy system operated continuously during the month. Solar energy satisfied 69 percent of the space heating

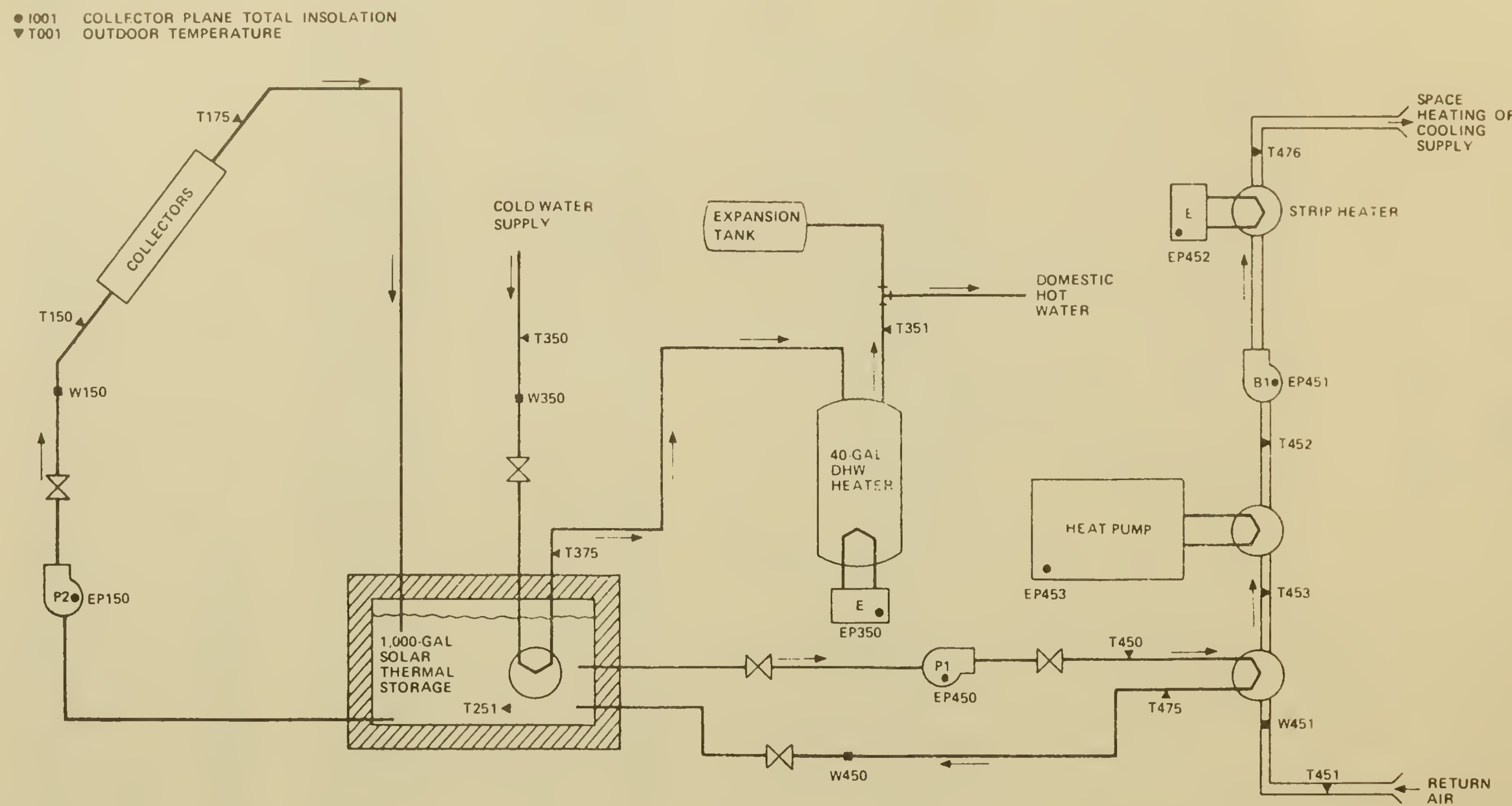

Figure 1. J. D. EVANS, INC., HOUSE B SOLAR ENERGY SYSTEM SCHEMATIC

requirements. Solar fraction of the DHW load and DHW auxiliary electrical energy were not determined because of problems with the DHW auxiliary energy sensor.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 17.6 million Btu for a daily average of 1519 Btu per square foot. This was above the estimated average daily solar radiation for this geographical area during March of 1381 Btu per square foot for a south-facing plane with a tilt of 45 degrees to the horizontal. The average ambient temperature during March was 46°F as compared with the long-term average for March of 43°F. The number of heating degree-days for the month (based on a 65°F reference) was 607, as compared with the long-term average of 688. The number of cooling degree-days was 8, as compared with the average of zero.

THERMAL PERFORMANCE

System - During March the solar energy system performed approximately the same as expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as inputs. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 3.7 million Btu. The estimated system solar fraction was 81 percent. The actual solar fraction could not be determined because of a power-sensor problem with the DHW electrical heater.

Collector - The total incident solar radiation on the collector array for the month of March was 17.6 million Btu. During the period the collector loop was operating the total insolation amounted to 14.6 million Btu. The total collected solar energy for the month of March was 4.5 million Btu, resulting in a collector array efficiency of 26 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 4.5 million Btu. Operating energy required by the collector loop was 0.15 million Btu.

Storage - Solar energy delivered to storage was 4.5 million Btu. There were 3.7 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 0.82 million Btu. This loss represented 18 percent of the energy delivered to storage. The storage efficiency was 82 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 112°F.

DHW Load - The DHW subsystem consumed 0.87 million Btu of solar energy and an undetermined amount of auxiliary electrical energy to satisfy a hot water load of 1.6 million Btu. The DHW subsystem contributed an electrical energy savings of 0.87 million Btu. A daily average of 82 gallons of DHW was consumed at an average temperature of 117°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 2.8 million Btu of solar energy and 0.81 million Btu of auxiliary electrical energy to satisfy a

space heating load of 4.1 million Btu. The heat pump supplied 0.75 million Btu and the auxiliary electrical strip heater supplied 0.49 million Btu of the load requirements. The solar fraction of the space heating load was 69 percent. The space heating subsystem consumed a total of 0.42 million Btu of operating energy, resulting in an electrical energy savings of 1.4 million Btu. The average ambient temperature inside the house was 68°F.

OBSERVATIONS

The electrical energy savings for the space heating subsystem were determined based on conventional heating using a heat pump.

ENERGY SAVINGS

The solar energy system provided a net electrical energy savings of 2.1 million Btu. The DHW subsystem provided an electrical energy savings of 0.87 million Btu, while the space heating subsystem contributed an electrical energy savings of 1.4 million Btu.

III. ACTION STATUS

Boeing is expected to investigate the power sensor problem with the DHW electrical heater.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: J.D. EVANS,INC. HOUSE E, COLUMBIA, MARYLAND — SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

SITE/SYSTEM DESCRIPTION:
THE INSTALLATION CONSISTS OF TWO ADJACENT BUT SEPARATE RESIDENCES USING A SINGLE J-BOX AND SDAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	17.617	MILLION BTU
	47104	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	4.505	MILLION BTU
	12047	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	46	DEGREES F
AVERAGE BUILDING TEMPERATURE	68	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.21	
ECSS OPERATING ENERGY	0.150	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.573	MILLION BTU
TOTAL ENERGY CONSUMED	*	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	1.592	4.057	N.A.	5.650	MILLION BTU
SOLAR FRACTION	*	69	N.A.	*	PERCENT
SOLAR ENERGY USED	0.870	2.818	N.A.	3.688	MILLION BTU
OPERATING ENERGY	N.A.	0.424	N.A.	0.573	MILLION BTU
AUX. THERMAL ENERGY	*	0.714	N.A.	*	MILLION BTU
AUX. ELECTRIC FUEL	*	0.810	N.A.	*	MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
ELECTRICAL SAVINGS	0.870	1.429	N.A.	2.149	MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	MILLION BTU

SYSTEM PERFORMANCE FACTOR: *

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: J.D. EVANS,INC. HOUSE E, COLUMBIA, MARYLAND — SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

SITE/SYSTEM DESCRIPTION:
THE INSTALLATION CONSISTS OF TWO ADJACENT BUT SEPARATE RESIDENCES USING A SINGLE J-BOX AND SDAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	18.586 GIGA JOULES
	534918 KJ/SQ.M.
COLLECTED SOLAR ENERGY	4.753 GIGA JOULES
	136802 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	8 DEGREES C
AVERAGE BUILDING TEMPERATURE	20 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.21
ECSS OPERATING ENERGY	0.158 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.605 GIGA JOULES
TOTAL ENERGY CONSUMED	* GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	1.679	4.280	N.A.	5.960 GIGA JOULES
SOLAR FRACTION	*	69	N.A.	* PERCENT
SOLAR ENERGY USED	0.918	2.973	N.A.	3.891 GIGA JOULES
OPERATING ENERGY	N.A.	0.447	N.A.	0.605 GIGA JOULES
AUX. THERMAL ENG	*	0.753	N.A.	* GIGA JOULES
AUX. ELECTRIC FUEL	*	0.855	N.A.	* GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	0.918	1.508	N.A.	2.268 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: *

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
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REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: J.D. EVANS,INC. HOUSE B, COLUMBIA, MARYLAND — SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.321	40	N	N	0.004	N	0.412
2	0.777	43	O	O	0.007	O	0.200
3	0.131	40	T	T	0.000	T	1.111
4	0.082	47			0.000		0.335
5	0.054	53	A	A	0.000	A	0.237
6	0.080	49	P	P	0.000	P	0.128
7	0.598	40	P	P	0.006	P	0.108
8	0.689	42	L	L	0.007	L	0.174
9	0.730	45	I	I	0.006	I	0.177
10	0.347	51	C	C	0.005	C	0.269
11	0.764	32	A	A	0.005	A	0.421
12	0.851	34	B	B	0.006	B	0.186
13	0.710	47	L	L	0.007	L	0.229
14	0.313	50	E	E	0.002	E	0.374
15	0.896	27			0.006		0.359
16	0.853	31			0.007		0.180
17	0.820	43			0.007		0.192
18	0.832	49			0.007		0.165
19	0.845	42			0.007		0.176
20	0.875	47			0.006		0.146
21	0.744	50			0.007		0.160
22	0.802	52			0.007		0.182
23	0.707	54			0.006		0.129
24	0.108	54			0.000		0.164
25	0.325	44			0.001		0.371
26	0.513	38			0.004		0.413
27	0.368	37			0.003		0.155
28	0.842	41			0.007		0.104
29	0.717	60			0.008		0.104
30	0.516	70			0.007		0.078
31	0.408	68			0.007		0.064
SUM	17.617	-	N.A.	N.A.	0.150	N.A.	-
AVG	0.568	46	N.A.	N.A.	0.005	N.A.	0.209
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: J.D. EVANS,INC. HOUSE B, COLUMBIA, MARYLAND SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.321	0.233	0.039	48	0.122
2	0.777	0.719	0.239	52	0.307
3	0.131	0.000	0.000	42	0.000
4	0.082	0.000	0.000	47	0.000
5	0.054	0.000	0.000	55	0.000
6	0.080	0.000	0.000	50	0.000
7	0.598	0.524	0.182	47	0.304
8	0.689	0.635	0.238	53	0.345
9	0.730	0.646	0.230	54	0.315
10	0.347	0.214	0.024	57	0.068
11	0.764	0.616	0.178	33	0.233
12	0.851	0.733	0.250	40	0.293
13	0.710	0.662	0.215	56	0.302
14	0.313	0.161	0.024	57	0.076
15	0.896	0.750	0.248	28	0.277
16	0.853	0.759	0.264	39	0.310
17	0.820	0.769	0.288	57	0.351
18	0.832	0.769	0.268	60	0.322
19	0.845	0.768	0.239	52	0.283
20	0.875	0.780	0.244	54	0.279
21	0.744	0.679	0.201	60	0.270
22	0.802	0.722	0.211	64	0.263
23	0.707	0.613	0.146	64	0.206
24	0.108	0.000	0.000	57	0.000
25	0.325	0.122	0.016	46	0.051
26	0.513	0.315	0.063	*	0.123
27	0.368	0.173	0.037	43	0.100
28	0.842	0.759	0.265	49	0.315
29	0.717	0.667	0.213	68	0.297
30	0.516	0.435	0.118	76	0.229
31	0.408	0.358	0.067	77	0.165
SUM	17.617	14.582	4.505	-	-
AVG	0.568	0.470	0.145	53	0.256
NESID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: J.D. EVANS,INC. HOUSE B, COLUMBIA, MARYLAND SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.039	0.132	-0.103	113	0.747
2	0.239	0.155	0.034	112	0.795
3	0.000	0.146	-0.118	104	1.000
4	0.000	0.028	-0.039	95	1.000
5	0.000	0.013	-0.018	92	1.000
6	0.000	0.010	-0.015	89	1.000
7	0.182	0.065	0.099	97	0.899
8	0.238	0.120	0.103	106	0.939
9	0.230	0.129	0.070	116	0.866
10	0.024	0.093	-0.100	119	-0.308
11	0.178	0.322	-0.157	105	0.925
12	0.250	0.158	0.072	102	0.920
13	0.215	0.163	0.048	104	0.981
14	0.024	0.117	-0.097	104	0.837
15	0.248	0.321	-0.054	96	1.078
16	0.264	0.154	0.085	99	0.906
17	0.288	0.157	0.067	107	0.780
18	0.268	0.137	0.113	117	0.934
19	0.239	0.149	0.030	127	0.747
20	0.244	0.127	0.031	129	0.649
21	0.201	0.119	0.033	133	0.755
22	0.211	0.146	0.004	138	0.713
23	0.146	0.091	0.010	141	0.696
24	0.000	0.018	-0.041	140	1.000
25	0.016	0.121	-0.155	125	-2.074
26	0.063	0.212	-0.136	104	1.201
27	0.037	0.097	-0.010	92	1.270
28	0.265	0.088	0.112	107	0.755
29	0.213	0.074	0.098	116	0.811
30	0.118	0.040	0.028	127	0.581
31	0.067	0.026	0.004	128	0.456
SUM	4.505	3.688	-0.001	-	-
AVG	0.145	0.119	-0.000	112	0.818
NBS ID	G200	G201	G202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: J.D. EVANS,INC. HOUSE B, COLUMBIA, MARYLAND — SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.095	*	0.050	N	*	*	N	0.050	N	30	86	143
2	0.064	*	0.027	O	*	*	O	0.027	O	47	120	98
3	0.063	*	0.026	T	*	*	T	0.026	T	53	120	93
4	0.073	*	0.028		*	*		0.028		48	121	112
5	0.046	*	0.013	A	*	*	A	0.013	A	51	121	70
6	0.031	*	0.010	P	*	*	P	0.010	P	47	119	48
7	0.033	*	0.012	P	*	*	P	0.012	P	46	119	51
8	0.031	*	0.014	L	*	*	L	0.014	L	50	120	49
9	0.061	*	0.034	I	*	*	I	0.034	I	47	119	96
10	0.055	*	0.030	C	*	*	C	0.030	C	47	118	86
11	0.056	*	0.024	A	*	*	A	0.024	A	53	118	92
12	0.056	*	0.027	B	*	*	B	0.027	B	51	119	88
13	0.044	*	0.022	L	*	*	L	0.022	L	54	119	68
14	0.056	*	0.022	E	*	*	E	0.022	E	52	119	89
15	0.044	*	0.016		*	*		0.016		54	120	69
16	0.078	*	0.031		*	*		0.031		55	118	127
17	0.034	*	0.018		*	*		0.018		55	119	55
18	0.083	*	0.050		*	*		0.050		51	118	135
19	0.024	*	0.022		*	*		0.022		52	118	38
20	0.030	*	0.027		*	*		0.027		57	118	49
21	0.044	*	0.034		*	*		0.034		50	117	72
22	0.086	*	0.069		*	*		0.069		54	116	143
23	0.054	*	0.052		*	*		0.052		53	116	93
24	0.017	*	0.014		*	*		0.014		53	115	29
25	0.061	*	0.046		*	*		0.046		48	117	104
26	0.080	*	0.031		*	*		0.031		54	118	132
27	0.033	*	0.011		*	*		0.011		56	118	56
28	0.024	*	0.015		*	*		0.015		52	118	39
29	0.044	*	0.030		*	*		0.030		54	119	73
30	0.058	*	0.040		*	*		0.040		54	117	96
31	0.035	*	0.026		*	*		0.026		51	118	61
SUM	1.592	-	0.870	N.A.	*	*	N.A.	0.870	N.A.	-	-	2554
AVG	0.051	*	0.028	N.A.	*	*	N.A.	0.028	N.A.	51	117	82
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: J.D. EVANS,INC. HOUSE B. COLUMBIA. MARYLAND SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.177	46	0.082	0.010	0.029	0.041	N	0.043	N	68	40
2	0.155	83	0.128	0.011	0.008	0.012	O	0.060	O	68	43
3	0.148	81	0.120	0.012	0.008	0.012	T	0.056	T	69	40
4	0.169	0	0.000	0.007	0.051	0.074		0.000		67	47
5	0.066	0	0.000	0.002	0.019	0.027	A	0.000	A	66	53
6	0.167	0	0.000	0.005	0.048	0.069	P	0.000	P	67	49
7	0.194	27	0.052	0.027	0.057	0.074	P	0.024	P	67	40
8	0.107	100	0.107	0.020	0.000	0.000	L	0.055	L	68	42
9	0.095	100	0.095	0.008	0.000	0.000	I	0.047	I	70	45
10	0.064	100	0.064	0.004	0.000	0.000	C	0.026	C	68	51
11	0.298	100	0.298	0.026	0.000	0.000	A	0.169	A	69	32
12	0.232	57	0.131	0.032	0.101	0.101	B	0.065	B	67	34
13	0.141	100	0.141	0.021	0.000	0.000	L	0.084	L	68	47
14	0.096	100	0.096	0.008	0.000	0.000	E	0.040	E	67	50
15	0.397	77	0.305	0.045	0.093	0.093		0.185		67	27
16	0.267	46	0.123	0.034	0.144	0.144		0.058		67	31
17	0.139	100	0.139	0.024	0.000	0.000		0.076		67	43
18	0.087	100	0.087	0.007	0.000	0.000		0.040		68	49
19	0.127	100	0.127	0.008	0.000	0.000		0.069		69	42
20	0.100	100	0.100	0.006	0.000	0.000		0.049		70	47
21	0.085	100	0.085	0.004	0.000	0.000		0.036		70	50
22	0.077	100	0.077	0.004	0.000	0.000		0.037		70	52
23	0.039	100	0.039	0.002	0.000	0.000		0.019		70	54
24	0.004	100	0.004	0.000	0.000	0.000		0.002		69	54
25	0.075	100	0.075	0.006	0.000	0.000		0.012		68	44
26	0.181	100	0.181	0.018	0.000	0.000		0.034		69	38
27	0.154	30	0.046	0.042	0.055	0.065		0.027		65	37
28	0.174	42	0.073	0.026	0.101	0.101		0.030		66	41
29	0.044	100	0.044	0.004	0.000	0.000		0.018		70	60
30	0.000	0	0.000	0.000	0.000	0.000		0.000		72	70
31	0.000	0	0.000	0.000	0.000	0.000		0.000		74	68
SUM	4.057	-	2.818	0.424	0.714	0.810	N.A.	1.429	N.A.	-	-
AVG	0.131	69	0.091	0.014	0.023	0.026	N.A.	0.046	N.A.	68	46
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: J.D. EVANS,INC. HOUSE E, COLUMBIA, MARYLAND — SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	857	N	40	48	N	N	N
2	2077	O	43	52	O	O	O
3	351	T	40	42	T	T	T
4	220		47	47			
5	144	A	53	55	A	A	A
6	213	P	49	50	P	P	P
7	1599	P	40	47	P	P	P
8	1843	L	42	53	L	L	L
9	1951	I	45	54	I	I	I
10	927	C	51	57	C	C	C
11	2042	A	32	33	A	A	A
12	2275	B	34	40	B	B	B
13	1899	L	47	56	L	L	L
14	838	E	50	57	E	E	E
15	2395		27	28			
16	2280		31	39			
17	2192		43	57			
18	2224		49	60			
19	2259		42	52			
20	2341		47	54			
21	1989		50	60			
22	2145		52	64			
23	1890		54	64			
24	289		54	57			
25	868		44	46			
26	1372		38	*			
27	985		37	43			
28	2252		41	49			
29	1916		60	68			
30	1380		70	76			
31	1092		68	77			
SUM	47104	N.A.	-	-	-	-	-
AVG	1519	N.A.	46	53	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: J.D. EVANS,INC. HOUSE B, COLUMBIA, MARYLAND SOLAR/1013-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.095	0.041	N	N	20.335
2	0.027	0.012	O	O	0.000
3	0.028	0.012	T	T	0.000
4	0.168	0.073			30.222
5	0.066	0.027	A	A	0.000
6	0.167	0.069	P	P	0.000
7	0.124	0.056	P	P	0.000
8	0.000	0.000	L	L	0.000
9	0.000	0.000	I	I	0.000
10	0.000	0.000	C	C	0.000
11	0.000	0.000	A	A	0.000
12	0.000	0.000	B	B	0.000
13	0.000	0.000	L	L	0.000
14	0.000	0.000	E	E	0.000
15	0.000	0.000			0.000
16	0.000	0.000			0.000
17	0.000	0.000			0.000
18	0.000	0.000			0.000
19	0.000	0.000			0.000
20	0.000	0.000			0.000
21	0.000	0.000			0.000
22	0.000	0.000			0.000
23	0.000	0.000			0.000
24	0.000	0.000			0.000
25	0.000	0.000			0.000
26	0.000	0.000			0.000
27	0.076	0.033			0.000
28	0.000	0.000			0.000
29	0.000	0.000			0.000
30	0.000	0.000			0.000
31	0.000	0.000			0.000
SUM	0.751	0.322	*	*	73.379
AVG	0.024	0.010	*	*	2.367

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N.A. DENOTES NOT APPLICABLE DATA.
NOTE: